

# Grounding issues

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- Properties of CF
- Grounding of L2-5 staves
- Grounding of L0-1
- Other groundings

# Properties of CF

- Breese's measurements show that
  1. CF that we are going to use is fairly conductive
  2. Possible noise can be greatly reduced by grounding
- More measurements when new Network Analyser arrives (May 15<sup>th</sup>)

# Grounding of L2-5 staves

- Cooling channels
  - PEEK
    - Non-conductive – no shielding necessary
    - Need to address a number of mechanical issues
    - CDF will use PEEK
  - CF
    - Conductive – will need to ground
      - Located close to silicon ( $\sim 100$   $\mu\text{m}$  from the backplane)  $\Rightarrow$  large capacitive coupling – potential source of noise
      - Best is to have a ground plane between the channels and the sensor backplane. The ground plane is shorted locally to hybrids
        - » The ground plane could be a mesh
        - » Extra components in the stave
        - » Need to insulate from HV
      - Can silicon backplane serve as shielding ?
        - » Thickness of Al (on the backplane) is  $\sim 1$   $\mu\text{m}$  (ELMA). Skin depth is  $\sim 26$   $\mu\text{m}$  @ 10 MHz. Needs testing.
        - » Shielding will depend on frequency
        - » Cooling channel needs to be grounded anyway at the end of stave
      - Can cooling channels be grounded locally to hybrids?
    - Need to address a number of mechanical issues
    - Potentially provides a stiffer (smaller height?) stave core

# Grounding of L2-5 staves

- CF C-channels provide stave rigidity
  - CF material is essential for the stave design
  - Conductive => needs grounding
    - Further away from silicon (>1-2 mm) – small capacitive coupling to silicon
    - Grounding at the end of the stave should be enough
    - Better to avoid creating a conductive circle around silicon – could have inductive coupling to silicon
- Grounding of staves together
  - Can be done at bulkheads
    - Screws to the bulkhead? Copper tape?
    - Several ground wires go from bulkhead to junction card region
  - Can be done through hybrid ground
    - All ground is provided through digital jumper cable

# Grounding of L0-1

- CF support for L0-1
  - Conductive : all worries above apply to L0-1
  - Best is to ground locally
    - To hybrids for L1
    - To sensors for L0
      - HV filtering board has a ground pad on it

# General Grounding

- Run 2B will have the same grounding scheme as Run 2A (because we do not change IBs)
  - All grounds (AVDD, DVDD, VCC, HV) are tied together in IBs
  - The grounds are kept together all the way from IB to HDI
    - Horseshoe is not connected to Central Calorimeter
    - Horseshoe has common ground for all ACs
- CDF has different grounding scheme
  - AVDD and DVDD grounds are tied together on the hybrid
  - They are kept separately all way to the power supplies
  - CDF is more sensitive to noise due to deadtimeless operation
    - Digital signals are source of noise for analog part